

Super-Transparent Thermal Insulation for Windows

Ivan I. Smalyukh

Professor of Physics, ECEE, MSE & RASEI
University of Colorado Boulder

Contact Name: Vlad Cherpak

Email: vladyslav.cherpak@colorado.edu



University of Colorado
Boulder

Windows waste energy & money...

Office & home windows

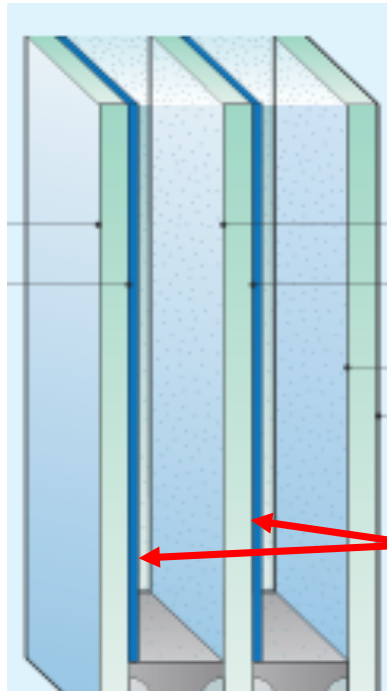


\$2 million wasted every 15 min

→20% of building energy lost through windows

→Existing products alter window's function, not durable, cannot fully solve the problem...

Deployment <3%



Bulky, expensive

Thermal super insulation

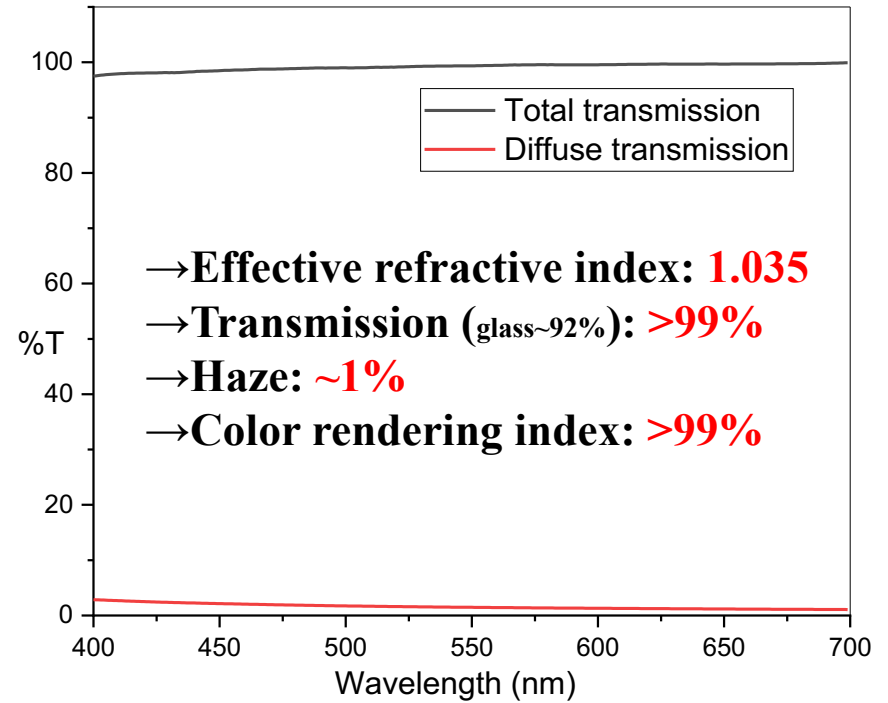


Mars Rover grade



9-12mW/(Km)

Highest-transparency solid: “frozen air” aerogel metamaterial



Optically closest to air



Now scaling & rolling

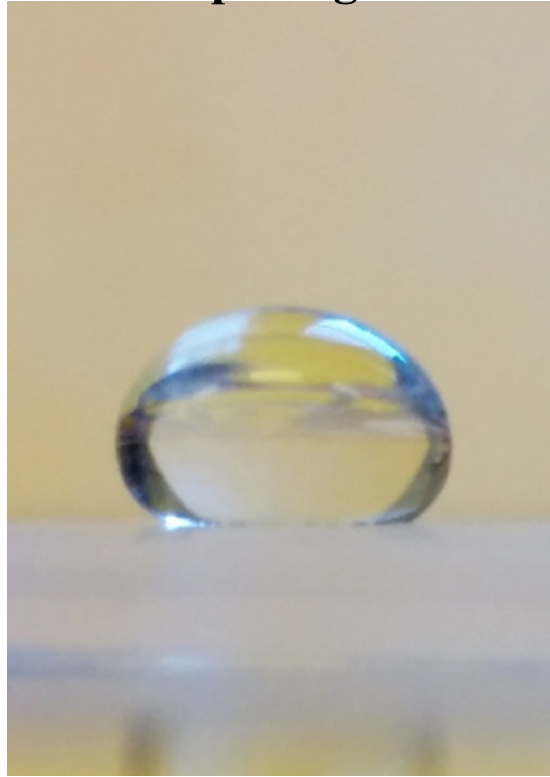


Key properties, cost & durability

Flexible



Water-repelling



Made from waste



Beer wort, food waste

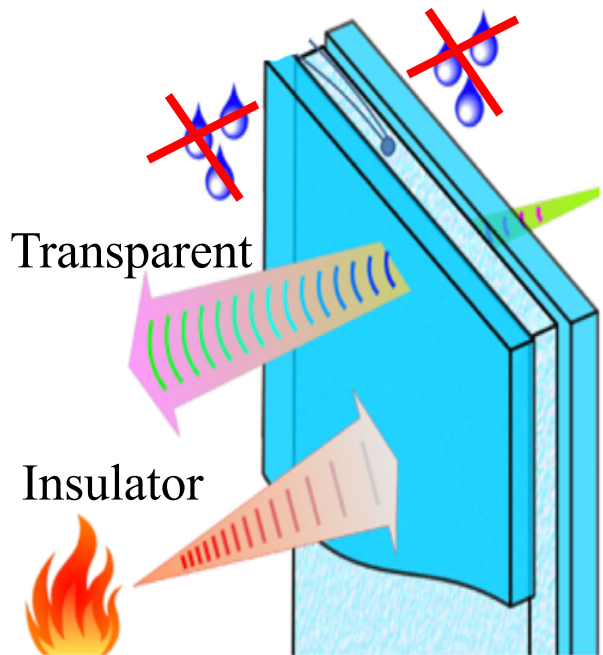
- UV, humidity, soaking, baking... property changes under 1%
- Low cost (under \$2.5 per square foot), <2 year payback period

Trillion-dollar opportunities

Consumer Benefits

- Relative savings (household) \$200-1000/year
- Condensation resistance...

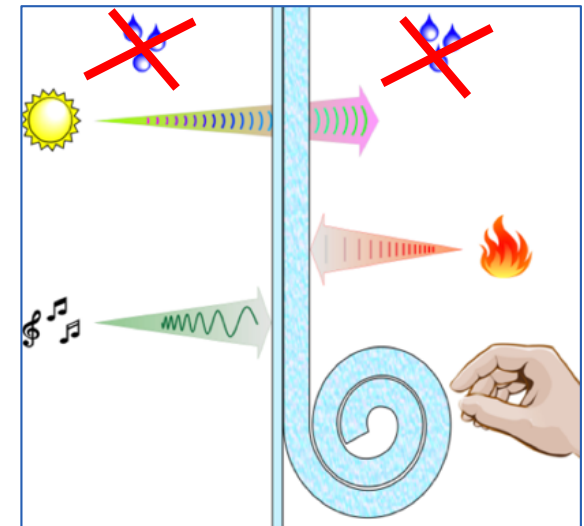
New breeds of >R5
thin 2-pane IGUs



Soundproofing &
deployment challenge

→ Windows can be as well-insulated as building walls!!!

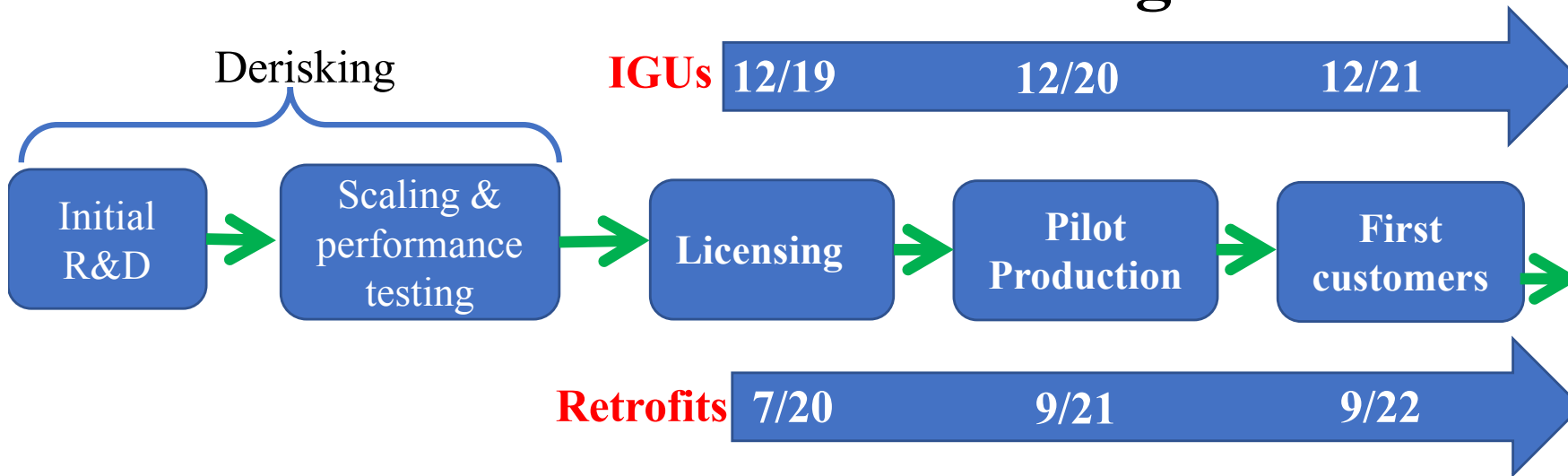
Window retrofits



A toddler could retrofit!

Let's do business together

Derisking



Global area of windows =



IP Portfolio

- 2 U.S. patent applications
- 3 provisional patent applications

